CROSS, HARDY

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Paying an incalculable debt

Dr. Hardy Cross, a native son, changed world, students learn.

By Dave Addis
STAFF WRITER

SMITHFIELD — A curious little ceremony was played out Thursday afternoon in a rural Smithfield cemetery, where a group of students gathered for inspiration from a man, long dead, whose work will shift the designs of their lives.

Such rituals are common at the graves of rock-poet Jim Morrison or the mystical Edgar Allan Poe. But the group that gathered Thursday — a college professor and a small knot of his students — came to honor a civil engineer, a profession seldom linked with the fluidity and grace of poetry.

The gravesite was that of Dr. Hardy Cross, a native son of southeastern Virginia.

"You might compare Hardy Cross to Walt Whitman, or to Shakespeare," said Dr. Zia Razzaq, who teaches engineering at Old Dominion University. "His accomplishments in engineering are at the level of what they contributed to language."

Cross was born and raised in Smithfield and died in 1959 in Virginia Beach. He graduated from and later taught at Norfolk Academy, and received a bachelor's degree from Hampden-Sydney College at age 17. His work is renowned worldwide, and for many years he headed the civil engineering department at Yale, but he is largely unknown here.

For that reason Razzaq, who studied Hardy Cross' methods in

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JOHN H. SHEALLY II/St

Dr. Zia Razzaq, an ODU engineering professor, teaches a class Thursday at the Smithfield grave of Dr. Hardy Cross, a world-renowned engineer and a native of southeastern Virginia.

"He developed a procedure by which, in a very short time, you could actually analyze or design a very complex building or bridge, calculate all the stresses loading on it.

"It is a big question for a designer, how big all those beams, columns and so on must be. Basically, it is a matter of designing a building strong enough to safely do its job."

Before Hardy Cross, tall buildings either were avoided or were built in a clumsy, wasteful manner.

"Up to then," Razzaq said, "it was gut feeling or people's experience. They were playing it very conservative, making buildings very heavy to be on the safe side. Basically, they were very unintelligent designs, five to 10 times heavier than needed. Look at the Empire State Building, it is two and one-half times heavier than the taller Sears Tower in Chicago.

"That shows the amount of waste and the amount of expense the earlier methods caused."

Cross' method, he said, "spread around the world like a wildfire when it was introduced. It is the standard in every engineering course in every country in the world, to this day."

Cross also revolutionized the design of water systems, developing a way to ensure that water would flow reliably through a maze of thousands of pipes at the required pressure.

"Before that," Razzaq said, "it was like, 'Oh, if the water is not coming to this part of the city, something is wrong.' It was hit and miss, trial and error. Using his method, people in major cities got a reliable supply of water.

"And, you know, that's important. People take that for granted."

People take for granted, as well, that an engineer is by definition a technocrat, somebody stumbling across campus with pen-protector in front pocket and a satchel full of computer software. But Cross didn't fit any mold. Classically educated, he would sprinkle lectures with citations from the Bible, or from "Alice in Wonderland."

His grave is marked by a spare granite headstone in a Smithfield cemetery, bearing the simple legend: Hardy Cross, 1885-1959. It is shaded by elms, and the setting worked perfectly as Razzaq led nine students through their lesson. They bent over their notebooks and calculators, applying Cross' calculation methods to a continuous-beam stress problem as songbirds worked the branches above.

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"I thought it was kind of a strange idea," said student Tim Brown, who is vice president of the ODU chapter of the American Society of Civil Engineers. "But I didn't know Cross had such a strong local background.

"We could have learned this in a

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Tribute: Class learns of engineer's power

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his native Pakistan, took his students for an afternoon of study in a vesper-quiet country graveyard. "His methods are being used everywhere in the world, even today," Razzaq said, "but it appears to me that people have forgotten where he was from, where he was born, where he was buried."

In a commonwealth that proudly honors its bright stars — even Gen. Douglas MacArthur and Walter Chrysler, whose ties to the region were tenuous — the memory of Hardy Cross is but a flicker kept alive by a small cadre of scientists. It can be difficult for them to describe the impact Cross has had on the lives of all the rest of us.

That is understandable, perhaps, given the incomprehension among laymen of what an engineer does. The works of an army general or an auto-industry magnate are self-evident. The dense mathematical formulae of a civil engineer are more daunting, too difficult for the uninitiated to look at, let alone understand.

Hardy Cross revolutionized the way tall buildings are made and enabled complex water systems for large cities.

What Hardy Cross did in the 1920s and '30s, in the most basic terms, was refine and vastly simplify the Herculean mathematical work needed to figure out how to build tall buildings and massive bridges, and make them safe.

"In Hardy Cross' day," Razzaq said, "if you wanted to design a highway bridge, or a railroad bridge, or if you wanted to design a high-rise building, you would end up with several thousand simultaneous mathematical equations. And there were no computers of the kind we have today.

"He developed a procedure by which, in a very short time, you could actually analyze or design a classroom, but this is more a way of paying respect."

Antonio Bassett, junior civil engineering major, echoed that: "It's a respect given to Hardy Cross. He's not really recognized the way a Robert Frost is."

Razzaq and a handful of professional engineers have long labored — with modest success — for a more prominent memorial to Cross. There is a Hardy Cross Hall of Fame that honors the contributions of local civil engineers, and a drive is in progress to complete a permanent memorial to him at ODU.

Among those pushing hardest for a lasting tribute is James A. Rives, a longtime Norfolk engineer, who knew Hardy Cross and attended lectures he gave in the 1930s at Virginia Tech. He remembers Cross as "congenial, somewhat reserved in a way, and one hell of a thinker. He was one fine person."

Rives said Cross believed that the steel and concrete creations of engineers should not overpower society, that the true art of engineering was to "convert the resources of nature for the betterment of mankind."

"If you realize that's what you're doing," said Rives, "then you're helping with living conditions and other situations in life, and life is going to be better for all of us. Hardy Cross believed that."

Staff writer Michele Snipe contributed to this story.